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# Relative weight-age in textbook and examination of secondary school chemistry-implications for selective study among students

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## Abstract

This research paper aims at the relationship between the examination and the textbook. It will also explore the limitations of the current evaluation methods in examination system and find the validity of the examination papers. For this purpose five years (from 1998 to 2002) of Chemistry papers of SSC (Secondary School Certificate) level were taken from the Board of Intermediate and Secondary Education, Lahore and analyzed. Analysis was done by calculating the standard weight-age of each paper and by also calculating number of questions selected from text book in the each year of examination. Pearson product moment correlation was employed to examine the relationship between content coverage and the standard weight-age given of each chapter. The value of correlation showed that the paper setter tried to follow the standard weight-age of textbook. The value of correlation in the paper of Chemistry between the standard weight-age of textbook and ten examination papers of BISE, Lahore is 0.01 to 0.91. This shows that in annual paper of 1999 the paper setter did not follow the table of specification and in 1999 supplementary examination he tried to follow the table of specification. Wide range of the value of correlation also shows that no proper paper pattern has been followed by the paper setters.

© 2010 Elsevier Ltd. Open access under [CC BY-NC-ND license](https://creativecommons.org/licenses/by-nc-nd/4.0/).*Keywords:* Secondary school; chemistry; textbook; weight-age in textbook; evaluation methods.

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## 1. Introduction

The need of evaluation in teaching cannot be denied. The most commonly used method of evaluation is traditional examination. The concerned people i.e. educators in particular and general public in general have shown their observations and reservations on this traditional system of examination. The major allegation that is being put on it is of cramming and lack of creativity on the part of students as well as the teachers. There is a need change the role of Boards of Intermediate and Secondary Education from merely examining bodies to research oriented professional organizations to do justice to the measurement and evaluation of the educational outcomes. Educational outcomes depend on the importance given to the relationship between textbooks and examination. Educational

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institutes are required to help the children to face the challenge by equating them in the development at a valid system of values and in the acquisition of the methods of rational thinking and the habits of scientific thought. Limitations of the current evaluation methods in examination systems will be identified by exploring the relationship between examination papers and textbooks in this research paper. Moreover the validity of the examination papers in relation to the textbooks will also be determined.

### *Review of the Related Literature*

There is no escape from the exams if you are a student or an employee of any government institute where promotion is considered and judged through departmental examinations. Hashmi, Shaida, Naqvi and Tahir write (2006) “Testing has come to have an important influence on the lives and careers of nations. Tests are used extensively in schools, psychological clinics, industry and government for the counseling, selection and placement of the people.” A definite definition of the word could not be easily traced out. It can be said a group of questions set to check one’s ability to determine the promotion or the position. Cronback (1969) defines, “A test is a systematic procedure for observing a person’s behaviour and describing it with aid of a numerical scale. (p. 85) According to Anatsi (1982), “A test is essentially an objective and standardized measure of sample of behaviour. In test observations are made on a small but carefully chosen sample of an individual’s behaviour.” (pp. 22)

### *Evaluation*

Evaluation of tests is based on the content and course designed in the textbooks by the authors. In Pakistan internal evaluation as Annual tests are used to decide whether the students pass or fail from level I – VII while the Boards of Intermediate and Secondary Education holds the public examinations for the levels 9-12. The compilation of papers covers various facets of education in Pakistan. In particular it draws attention to the basic problems and prospects in the system of education because at the past log, the need for educational expansion and improvement remains to be met. It has limitations like dependence of the examination on the curriculum only, unawareness of the teachers for paper – setting, undue focus on specific chapters, lack of training for paper marking and influence of personal basis of the teachers while marking the papers.

### *Textbooks*

Textbooks are used as a tool to convey knowledge and are a standard and set pattern of the instructions to be imparted to the students. Chasnoff (1964) writes, “Textbooks has been designed to perform on function supplying course of study.” (p – 110) in the opinion of Foshay cited in Welt (1997) “The tesxtbook is a basic source of idea and information. It represents the material in an organized sequence, is graded for reading skills and can be used to stimulate many kinds of activities.” Cronback (1984) discussed that, “Tropically, the textbook is organized as course of study so that the chapters are to be studied in sequence. Later chapters pre-suppose an acquaintance with earlier chapters. (p 55).

### *Development of a textbooks in Pakistani Perspective*

In Pakistan, a textbook is always printed from the Punjab Textbook Board with its specific symbol i.e. Monogram under the supervision of Federal Ministry of Education. According to Haroon (1992), to develop a textbook in Pakistan the Ministry of Education frame the curricular activities and these are also supplied by the curriculum wing. Eminent scholars are invited through advertisements in the press by the textbook board to write manuscripts according to the curricula. Received manuscripts are scrutinized by a review committee. If judged satisfactory, the manuscript is passed on to the editorial branch which checks its accuracy and makes it press worthy. Illustrations are prepared by art cell reviewed by the subject specialists of the board to ensure that all the requirements have been met. Manuscripts are thus submitted to the national review committee for approval. In case the national committee suggests certain changes or amendments in the manuscripts, the same are incorporated in the manuscript. Special machinery has been created for proof reading of the manuscript before printing to eliminate

mistakes. The dummy is supplied to the press committee, which fixes the price according to the agreement which is printed on each copy. The accepted manuscripts are published and prescribed as a textbook.

### Procedure

The sample of this study was examination in the subject of Chemistry papers of SSC (Secondary School Certificate) from 1998 to 2002 Board of Intermediate and Secondary Education, Lahore. The questions papers of the said examination were used as an instrument for the exploration of this study.

Analysis of these question papers was done by calculating the standard weight-age for each paper and by also calculating the number of questions selected from each chapter in the each year of examination for above mentioned subject using the following formula:

$$\text{Standard Weight-age of Each Chapter} = \frac{\text{No of pages allocated to chapters}}{\text{Total No. of the pages of the book}} \times 100$$

Pearson product moment correlation was employed to examine the relationship between content coverage in the examination and that if standard weight-age of each chapter. Statistical Package for Social Sciences (SPSS) was used for the implication of correlation analysis.

### Analysis of Data

The purpose of present research was to explore the relationship between weight-age of content in the examination from each chapter and its correlation with standard weight-age of each chapter in the book for the subject of Chemistry at Secondary School Level. Results are given as follows.

Table 1

Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year Annual 1998

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 4.17                                |
| 2      | 7.09                            | 12.50                               |
| 3      | 9.54                            | 8.33                                |
| 4      | 7.58                            | 12.50                               |
| 5      | 4.16                            | 00                                  |
| 6      | 5.38                            | 10.00                               |
| 7      | 6.85                            | 2.50                                |
| 8      | 9.05                            | 12.50                               |
| 9      | 8.07                            | 9.17                                |
| 10     | 10.02                           | 3.33                                |
| 11     | 12.71                           | 12.50                               |
| 12     | 9.78                            | 12.50                               |

The coefficient of correlation is 0.36 which is positive and shows that the paper setter has tried to follow the paper pattern.

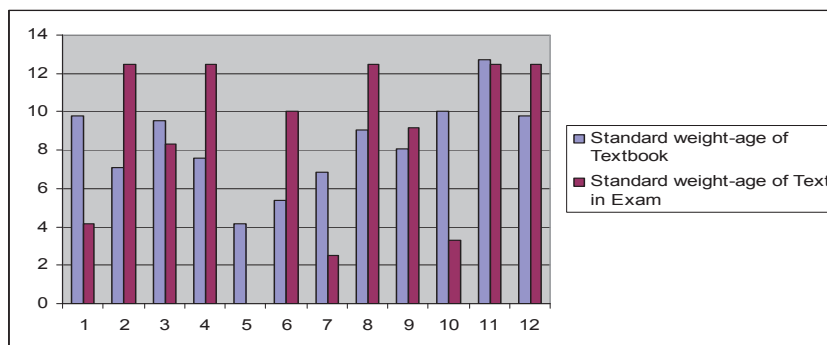


Figure1. Graphic Presentation

Table 2

Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year Supplementary 1998

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 4.17                                |
| 2      | 7.09                            | 8.33                                |
| 3      | 9.54                            | 12.50                               |
| 4      | 7.58                            | 8.33                                |
| 5      | 4.16                            | 4.17                                |
| 6      | 5.38                            | 5.00                                |
| 7      | 6.85                            | 7.50                                |
| 8      | 9.05                            | 12.50                               |
| 9      | 8.07                            | 12.50                               |
| 10     | 10.02                           | 12.50                               |
| 11     | 12.71                           | 00                                  |
| 12     | 9.78                            | 12.50                               |

The coefficient of correlation is 0.54 which is positive and shows that the paper setter has tried to follow the paper pattern.

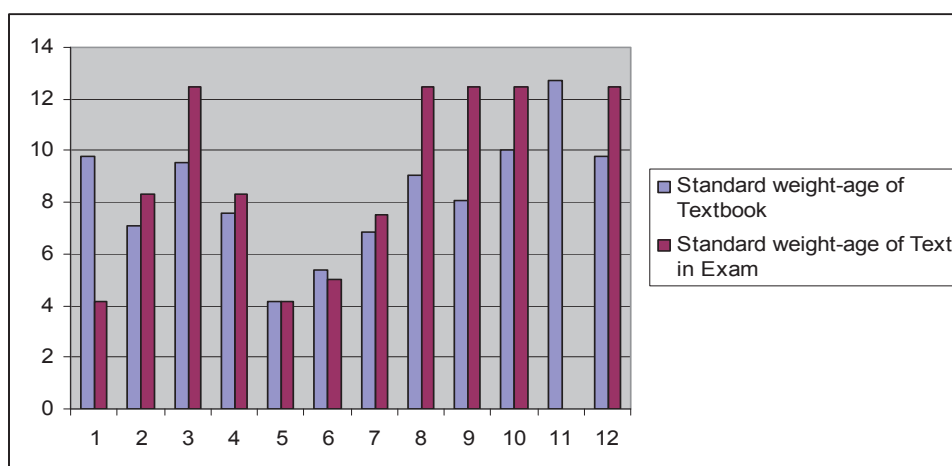


Figure2. Graphic Presentation

Table 3

Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year Annual 1999

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 7.50                                |
| 2      | 7.09                            | 8.33                                |
| 3      | 9.54                            | 9.70                                |
| 4      | 7.58                            | 8.33                                |
| 5      | 4.16                            | 4.17                                |
| 6      | 5.38                            | 5.00                                |
| 7      | 6.85                            | 7.50                                |
| 8      | 9.05                            | 12.50                               |
| 9      | 8.07                            | 6.67                                |
| 10     | 10.02                           | 5.83                                |
| 11     | 12.71                           | 12.50                               |
| 12     | 9.78                            | 12.50                               |

The coefficient of correlation is 0.71 which is positive and shows that the paper setter has tried to follow the paper pattern.

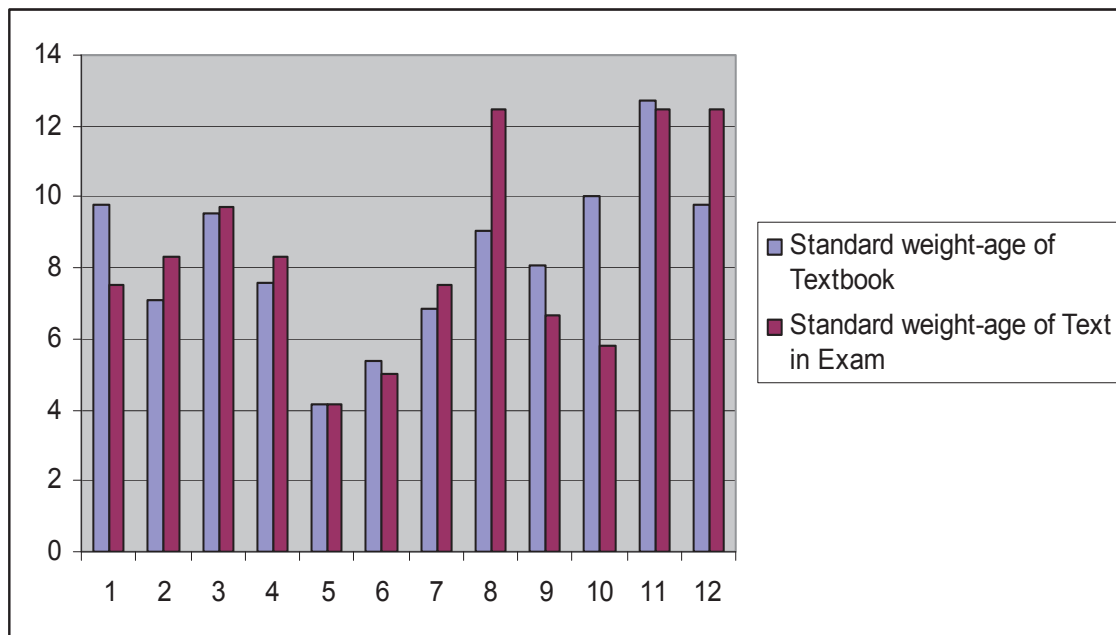


Figure3. Graphic Presentation

Table 4

Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year supplementary 1999

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 12.50                               |
| 2      | 7.09                            | 12.50                               |
| 3      | 9.54                            | 00                                  |
| 4      | 7.58                            | 12.50                               |
| 5      | 4.16                            | 9.17                                |
| 6      | 5.38                            | 00                                  |
| 7      | 6.85                            | 3.33                                |
| 8      | 9.05                            | 12.50                               |
| 9      | 8.07                            | 12.50                               |
| 10     | 10.02                           | 12.50                               |
| 11     | 12.71                           | 00                                  |
| 12     | 9.78                            | 12.50                               |

The coefficient of correlation is -0.04 which is negative and shows that the paper setter has not tried to follow the paper pattern and table of specification.

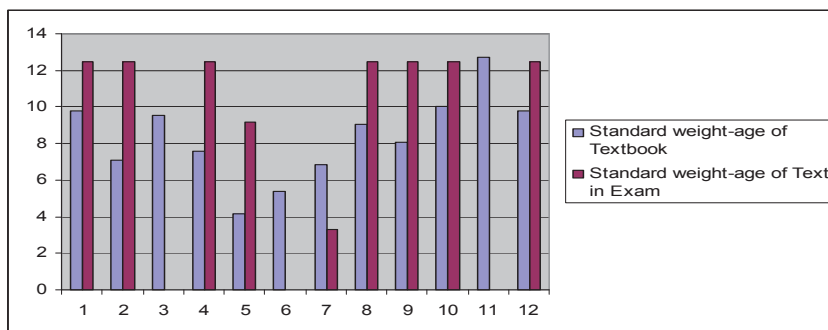


Figure4. Graphic Presentation

Table 5  
Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year Annual 2000

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 6.67                                |
| 2      | 7.09                            | 9.17                                |
| 3      | 9.54                            | 4.17                                |
| 4      | 7.58                            | 13.33                               |
| 5      | 4.16                            | 7.50                                |
| 6      | 5.38                            | 9.17                                |
| 7      | 6.85                            | 6.67                                |
| 8      | 9.05                            | 8.33                                |
| 9      | 8.07                            | 10.00                               |
| 10     | 10.02                           | 6.67                                |
| 11     | 12.71                           | 8.33                                |
| 12     | 9.78                            | 10.00                               |

The coefficient of correlation is -0.016 which is negative and shows that the paper setter has not tried to follow the paper pattern and table of specification.

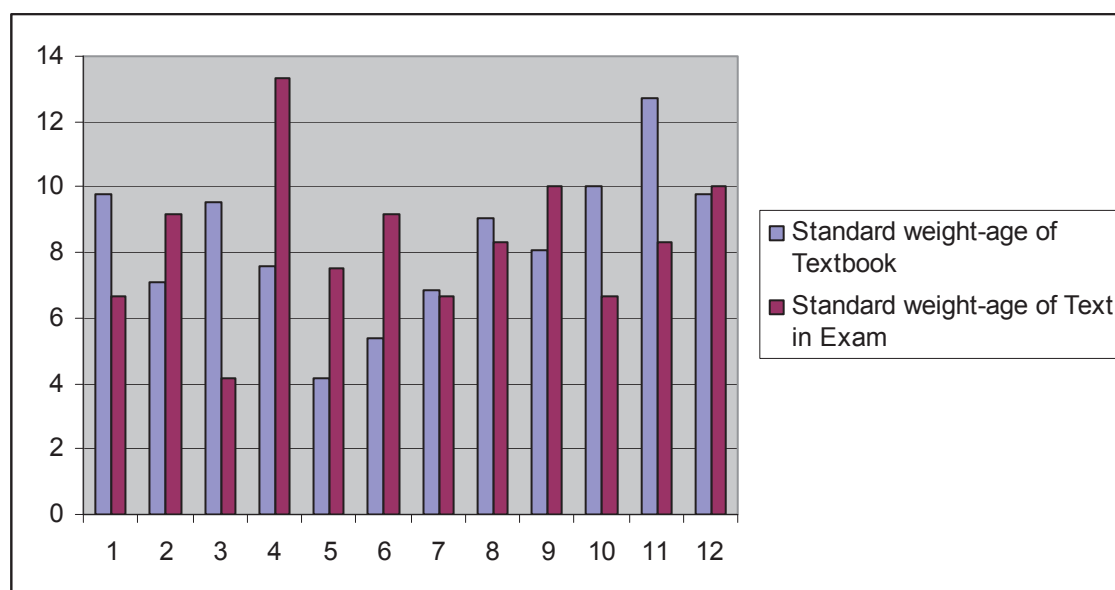


Figure5. Graphic Presentation

Table 6  
Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year Supplementary 2000

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 6.67                                |
| 2      | 7.09                            | 9.17                                |
| 3      | 9.54                            | 4.17                                |
| 4      | 7.58                            | 13.33                               |
| 5      | 4.16                            | 7.50                                |
| 6      | 5.38                            | 9.17                                |
| 7      | 6.85                            | 6.67                                |
| 8      | 9.05                            | 8.33                                |
| 9      | 8.07                            | 10.00                               |
| 10     | 10.02                           | 6.67                                |
| 11     | 12.71                           | 8.33                                |
| 12     | 9.78                            | 10.00                               |

The coefficient of correlation is -0.31 which is negative and shows that the paper setter has tried to follow the paper pattern and table of specification.

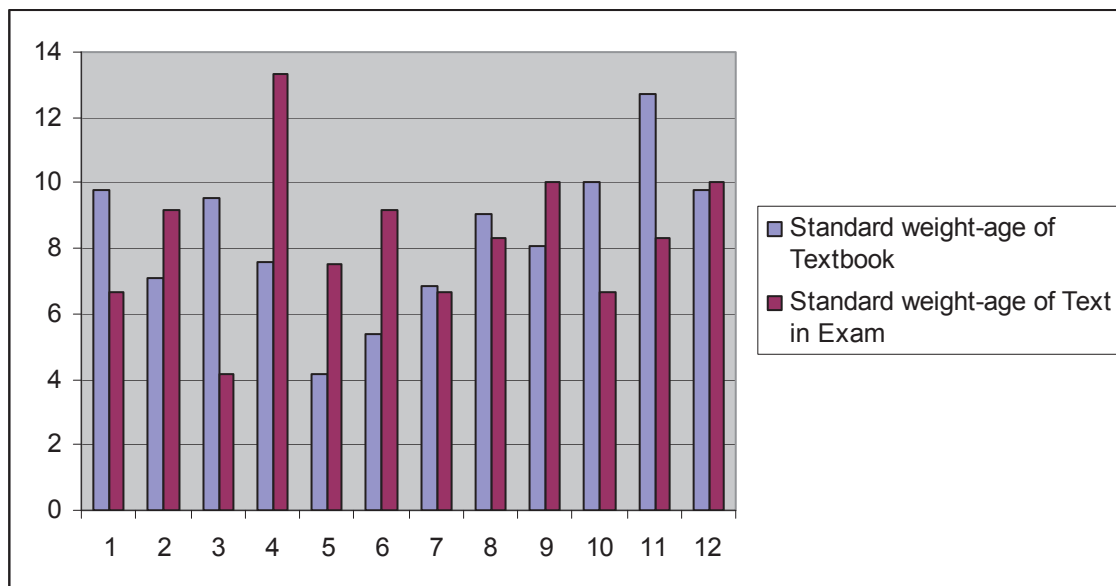


Figure6. Graphic Presentation

Table 7

Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year Annual 2001

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 6.67                                |
| 2      | 7.09                            | 5.00                                |
| 3      | 9.54                            | 9.17                                |
| 4      | 7.58                            | 8.33                                |
| 5      | 4.16                            | 7.50                                |
| 6      | 5.38                            | 9.17                                |
| 7      | 6.85                            | 10.83                               |
| 8      | 9.05                            | 11.67                               |
| 9      | 8.07                            | 10.00                               |
| 10     | 10.02                           | 3.33                                |
| 11     | 12.71                           | 8.33                                |
| 12     | 9.78                            | 10.00                               |

The coefficient of correlation is -0.67 which is negative and shows that the paper setter has not tried to follow the paper pattern and the table of specification.

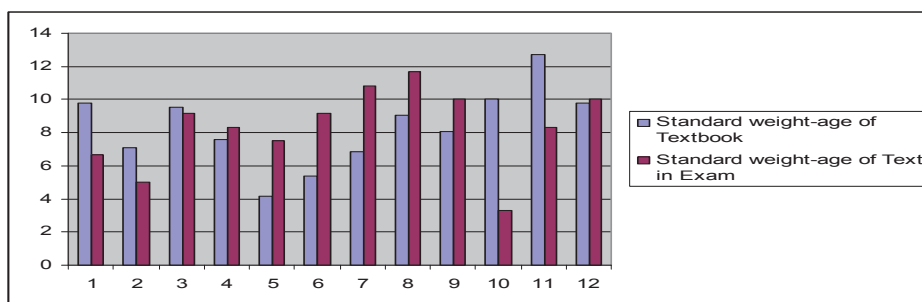


Figure7. Graphic Presentation

Table 8  
Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year Supplementary 2001

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 11.67                               |
| 2      | 7.09                            | 4.17                                |
| 3      | 9.54                            | 8.33                                |
| 4      | 7.58                            | 9.17                                |
| 5      | 4.16                            | 7.50                                |
| 6      | 5.38                            | 9.17                                |
| 7      | 6.85                            | 6.67                                |
| 8      | 9.05                            | 12.50                               |
| 9      | 8.07                            | 10.00                               |
| 10     | 10.02                           | 6.67                                |
| 11     | 12.71                           | 4.17                                |
| 12     | 9.78                            | 10.00                               |

The coefficient of correlation is -0.48 which is negative and shows that the paper setter has not tried to follow the paper pattern and the table of specification.

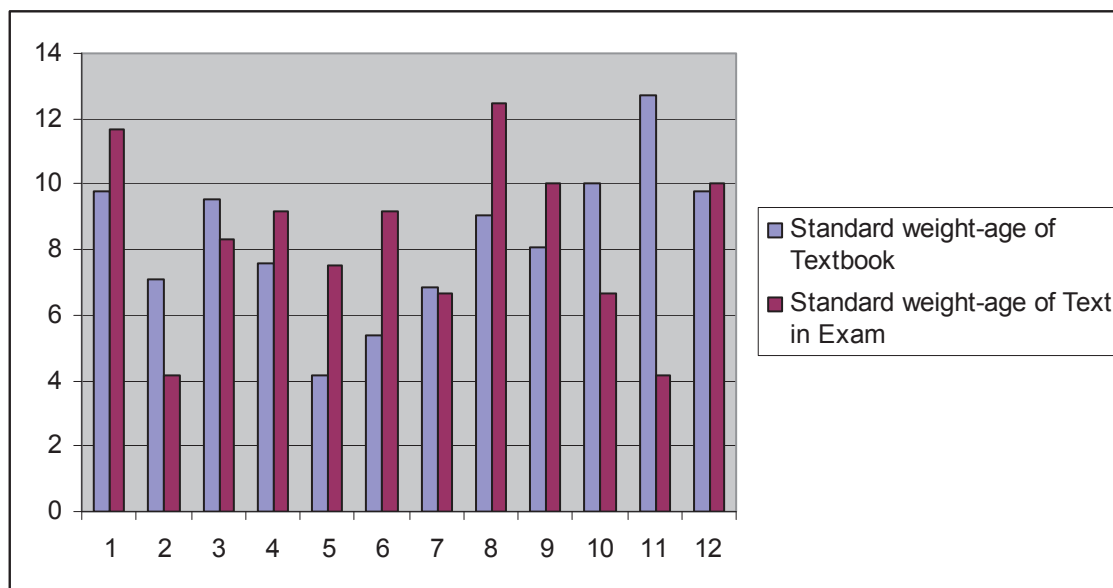


Figure8. Graphic Presentation

Table 9  
Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year Annual 2002

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 11.67                               |
| 2      | 7.09                            | 12.50                               |
| 3      | 9.54                            | 5.00                                |
| 4      | 7.58                            | 5.00                                |
| 5      | 4.16                            | 6.67                                |
| 6      | 5.38                            | 9.17                                |
| 7      | 6.85                            | 3.33                                |
| 8      | 9.05                            | 5.00                                |
| 9      | 8.07                            | 9.17                                |
| 10     | 10.02                           | 11.67                               |
| 11     | 12.71                           | 8.33                                |
| 12     | 9.78                            | 12.50                               |



The coefficient of correlation is 0.23 which is positive and shows that the paper setter has tried to follow the paper pattern and the table of specification.

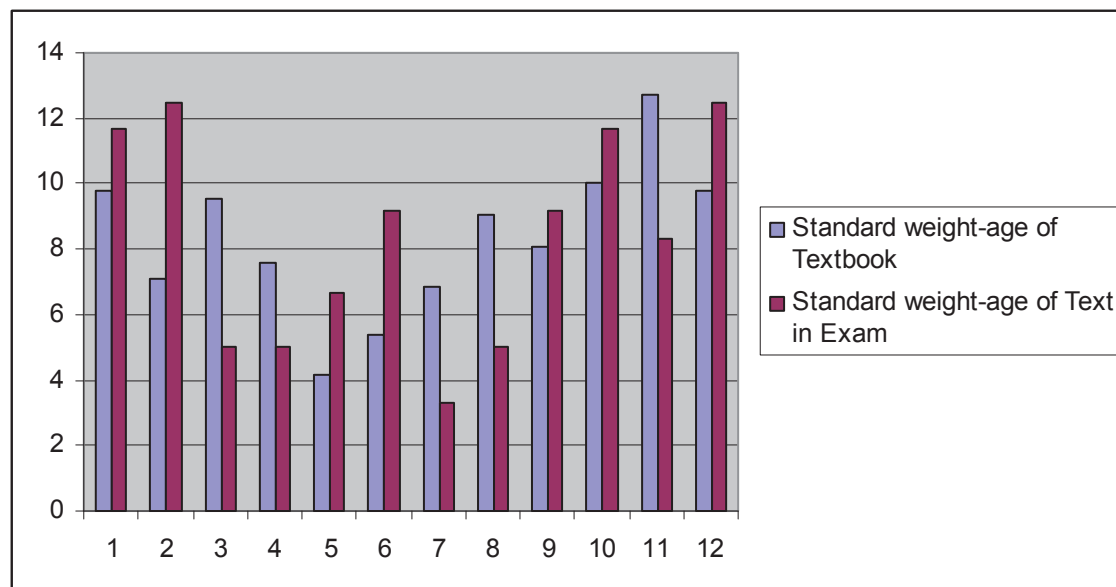


Figure9. Graphic Presentation

Table 10

Standard weight-age of textbook and Weight-ages of text in Exams in the subject of Chemistry in the year Annual 2001

| S / No | Standard weight-age of Textbook | Standard weight-age of Text in Exam |
|--------|---------------------------------|-------------------------------------|
| 1      | 9.78                            | 9.78                                |
| 2      | 7.09                            | 13.33                               |
| 3      | 9.54                            | 5.00                                |
| 4      | 7.58                            | 9.70                                |
| 5      | 4.16                            | 6.67                                |
| 6      | 5.38                            | 9.17                                |
| 7      | 6.85                            | 6.67                                |
| 8      | 9.05                            | 9.17                                |
| 9      | 8.07                            | 9.17                                |
| 10     | 10.02                           | 6.67                                |
| 11     | 12.71                           | 9.17                                |
| 12     | 9.78                            | 9.17                                |

The coefficient of correlation is 0.004 which is positive and shows that the paper setter has not tried to follow the paper pattern and the table of specification.

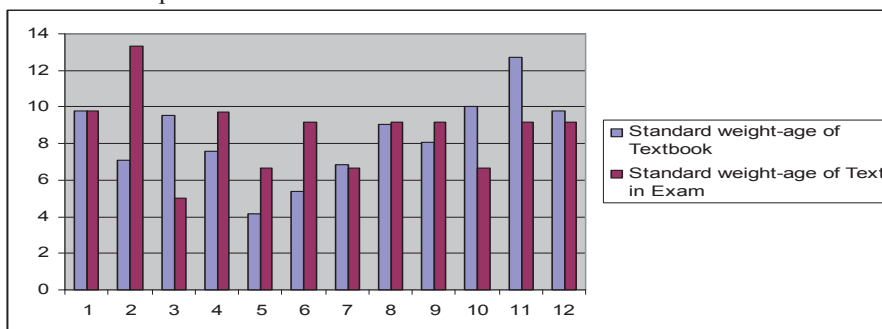


Figure10. Graphic Presentation

Table 11  
Coefficient of correlation in the subject of Chemistry

|         | x               | y <sub>1</sub> | y <sub>2</sub> | y <sub>3</sub> | y <sub>4</sub> | y <sub>5</sub> | y <sub>6</sub> | y <sub>7</sub> | y <sub>8</sub> | y <sub>9</sub> | y <sub>10</sub> |      |
|---------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|------|
|         | x               | 1.00           |                |                |                |                |                |                |                |                |                 |      |
| 1998- I | y <sub>1</sub>  | .36            | 1.00           |                |                |                |                |                |                |                |                 |      |
| 1998-II | y <sub>2</sub>  | .05            | .16            | 1.00           |                |                |                |                |                |                |                 |      |
| 1999-I  | y <sub>3</sub>  | .71            | .68            | .15            | 1.00           |                |                |                |                |                |                 |      |
| 1999-II | y <sub>4</sub>  | .04            | .03            | .43            | .02            | 1.00           |                |                |                |                |                 |      |
| 2000-I  | y <sub>5</sub>  | .16            | .56            | .01            | .08            | .42            | 1.00           |                |                |                |                 |      |
| 2000-II | y <sub>6</sub>  | .16            | .07            | .52            | .17            | .06            | .12            | 1.00           |                |                |                 |      |
| 2001-I  | y <sub>7</sub>  | .07            | .28            | .14            | .41            | .27            | .12            | .39            | 1.00           |                |                 |      |
| 2001-II | y <sub>8</sub>  | .05            | .05            | .38            | .09            | .36            | .12            | .21            | .48            | 1.00           |                 |      |
| 2002-I  | y <sub>9</sub>  | .23            | .13            | .01            | .05            | .40            | .10            | .05            | .60            | .10            | 1.00            |      |
| 2002-II | y <sub>10</sub> | .00            | .59            | .18            | .19            | .42            | .61            | .05            | .18            | .07            | .51             | 1.00 |

X= Standard Weight-age of Textbook

Y= Weight-age of Text in Examination paper per Chapter.

This table shows that in the subject of Chemistry the correlation between the standard weight-age of textbook and the examination paper of BISE, Lahore is (0.00 – 0.71). The correlation among all the papers of BISE, Lahore is (0.01 – 0.68).

### Conclusion and Findings

1. The value of correlation between the standard weight-age of textbook and ten examination papers of BISE, Lahore is 0.01 – 91. This shows that in Annual 1999, the paper setter did not follow the table of specification and in supplementary 1999 the paper followed the table of specification.
2. The value of correlation among all the papers is 0.02 – 0.97. The greater range shows that there is no paper pattern and the different paper setters followed different rules.

### Recommendations

1. More subjects should be included in the study.
2. More boards of intermediate and secondary education should be included.
3. The authorities of BISE should advise the paper setters to follow the table of specification.
4. BISE should conduct training sessions for the paper setters.
5. Item analysis should be done by the authorities.

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